New claims 170, 171, and 172 correspond to cancelled claims 148, 162 and 163 and are directed to the same subject matter. No new claim has been added that corresponds with cancelled claim 138 or its subject matter.

Applicants also wish to point out that the claim language of independent claims 164, 167, 173 and 174 has been amended to more closely conform with the claims of recently allowed U.S. Application Serial No. 07/130,070, a related application. The present application and U.S. Serial No. 07/130,070 have the same inventive entity and each claim priority from the same parent application, U.S. Serial No. 496,915, now U.S. Patent No. 4,711,955 (a copy enclosed as Exhibit A). The allowed claims of U.S. Serial No. 07/130,070 are directed to methods for using the complexes claimed in the present application. The definitional language for moieties A and B, which has been approved in U.S. Serial No. 07/130,070 and found not to be indefinite under 35 U.S.C. §112, has been incorporated into the present claims. A copy of the notice of allowance and the allowed claims for U.S. Serial No. 07/130,070 are enclosed for the Examiner's convenience as Exhibit B.

In the May 19, 1993 Office Action, the Examiner rejected all the pending claims under the judicially created doctrine of obviousness-type double patenting over the claims of U.S. Patent No. 4,711,955. As noted by the Examiner, a terminal disclaimer was submitted to overcome a similar rejection in parent application U.S. Serial No. 130,097. The Examiner has indicated that the previously submitted terminal disclaimer is not applicable to the present application and submission of a new terminal disclaimer specifically directed to the present application is required.

Applicants do not agree that the claims of the present application are obvious variations of the claims of U.S. Patent No.

4,711,955; however, in order to advance prosecution, applicants agree to submit a terminal disclaimer executed by the assignee of record of both the present application and U.S. Patent No. 4,711,955. The disclaimer is in the process of being executed and will be forwarded to the Examiner in the very near future. In light of the planned submission of a terminal disclaimer, applicants respectfully request that the Examiner withdraw the rejection under the judicially created doctrine of obviousness-type double patenting.

The Examiner also rejected claim 138 under 35 U.S.C. §112, first, second and fourth paragraphs. The Examiner contends that claim 138 is an improper dependent claim, is indefinite for failing to particularly point out and claim the subject matter of the invention, and is not enabled by the disclosure.

Although applicants maintain that the Examiner's position is incorrect, claim 138 has been cancelled hereinabove and no equivalent claim has been added. Applicants cancel claim 138 without prejudice and expressly reserve the right to reassert claim 138, or the subject matter thereof, in the continued prosecution of this application or by means of a continuation or divisional application. In light of the cancellation of claim 138, applicants request withdrawal of the rejections under 35 U.S.C. § 112 directed toward this claim.

In the May 19 Office Action, claims 101-103, 110-112, 148 and 152-163 were rejected under 35 U.S.C. § 112, second paragraph, as indefinite for failing to particularly point out and distinctly claim the subject matter applicants regard as the invention. Specifically, the Examiner objects to the use of variations of the verb "to comprise" in the claims of the present application. The Examiner maintains that claims to chemical compounds are indefinite

when variations of the verb "to comprise" are included. The Examiner further objects to the use of the term "composition" for implying the presence of more than one molecular component, and the use of the term "at least" because it does not define an upper limit.

With respect to the Examiner's criticism of the term "comprise" (or variations thereof) and "composition", applicants believe there is a misunderstanding as to what is being claimed, at least regarding previously pending claims 101 and 110. These claims were not directed to chemical compounds per se, but rather to compositions which comprise compounds having the structures as set forth in the claims. The "compound" components of the compositions were sufficiently defined by the use of structural formulae. The claims further specified that the compositions contain a detectable polypeptide capable of forming a complex with 'A' (see the last element of claims 101 and 110). These compositional claims are no different than those of many issued U.S. patents which are directed to compositions (such as pharmaceutical compositions) which comprise structurally defined compounds together with another component (such as a vehicle or carrier) (see, e.g., U.S. Patent No. 5,245,022, claim 20).

Although applicants maintain that the use of the terms "composition" and "composition comprising" is proper, they have nevertheless cancelled claims 101 and 110 and have substituted new claims 164 and 167. These claims have been written to clearly indicate that they are not directed to the compounds per se but rather to complexes of the compound and a detectable polypeptide.

With respect to claims 156 and 157, applicants agree that the claims arguably could have been read as directed to compounds per se. Accordingly, applicants have cancelled these claims and added

new claims 173 and 174 which do not recite the phrase "composition comprising" and are expressly directed to structurally defined compounds.

Additionally, in response to the Examiner's remarks, the term "comprises" and variations thereof have been deleted from the definition of 'A'. For example, in claim 164, 'A' is now defined as follows:

> wherein A represents at least three carbon atoms, is capable of specifically complexing with the detectable polypeptide when A is linked to B, and represents a component of a signalling moiety capable of producing a detectable signal.

With respect to the Examiner's remarks regarding the term "at least three carbon atoms" in the definition of 'A' and his position that the term fails to provide an upper limit and therefore makes the claims indefinite, applicants respectfully disagree. An upper limit on the size of 'A' is unnecessary and unrealistic, and would be inconsistent with the scope of the invention.

The definition of 'A' with the term "at least three carbon atoms" is sufficiently clear, concise and exact to enable one skilled in the art to practice the invention. As set forth in the disclosure (and as readily apparent to those skilled in the art upon reading the disclosure), 'A' may be a relatively small or very large group and still be useful in the invention as long as it is detectable or capable of binding to the detectable polypeptide. The claim language excludes 'A' moieties which would be below the minimum level of detection. Applicants have fully defined 'A' by type, by example, and by function (see, e.g., application p. 10, lines 33 et seq. and p. 12, lines 1 et seq.); they have provided a functional as well as a structural definition (see, e.g., application p. 12, lines 7 et seq.); and they have disclosed preferred and specific examples (see, e.g., pp. 12 and 13, lines 1

et seq.). In view of the claim definition of 'A' (especially when read in light of the specification), one skilled in the art would clearly recognize the metes and bounds of what is being claimed.

It is also noteworthy that the Court of Appeals, Federal Circuit (CAFC) upheld the use of lower limits (with no upper limits) in claim language in Ralston Purina Company v. Far-Mar Co., Inc., 772 F.2d 1570, 227 USPQ 177 (Fed. Cir. 1985). A copy is enclosed as Exhibit C. In the case, the claims in question recited phrases having no upper limit, such as "in excess of 212°F" and "substantially above 212°F." The Court cited with approval the lower court's rationale that the open-ended claim limitations "would be limited by what a person skilled in the art would understand to be workable." 227 USPQ at 180.

Furthermore, essentially the same language for moiety 'A' is present in the allowed claims of U.S. Serial No. 07/130,070 (see Exhibit A), illustrating that the language meets the statutory requirements for definiteness under 35 U.S.C. §112. Additionally, notices of allowance for other U.S. applications concerning hybridization probes have been issued wherein the definition of the signalling moiety is broader than the definition of 'A'. For example, the claims of U.S. Serial No. 07/532,704 have been allowed with the definition of the signalling group (designated "Sig") as "a detectable moiety" (see claim 1) and as "a detectable moiety containing at least 3 carbon atoms" (see dependent claim 206). Copies of the allowed claims and the issued Notice of Allowance are enclosed as Exhibit D.

In light of the amendments to the definition of 'A' and the arguments presented herein, applicants respectfully request that the Examiner reconsider and withdraw the rejections based on moiety 'A'.

The Examiner also noted that claim 157 did not define "n" although it was used in the structural formula. Applicants have corrected the error in corresponding new claim 174 by amending the structural formula, and its associated definitions, to more precisely reflect the invention and to conform the claim language with the language of the allowed claims of U.S. Serial No. 07/130,070.

The Examiner also rejected the pending claims as indefinite under 35 U.S.C. §112, first and second paragraphs. The Examiner maintains that the terms "purine", "deazapurine" and "pyrimidine" are unduly broad and indefinite, that the description for 'A' and the "detectable polypeptide" are overly broad, and that the terms "ligand", "enzyme", "substrate", and "detectable product" in claims 148, 151 and 162 are indefinite and unenabled.

With respect to the use of the terms "purine", "deazapurine", and "pyrimidine" in the definition of base moiety 'B', the Examiner contends that there is insufficient exemplary matter to enable the various members of the group. Applicants respectfully disagree. The present invention relates to modifying nucleotides for insertion into DNA, without interfering with normal Watson-Crick hydrogen bonding. The ability to practice this invention requires the knowledge of the correct labels and the correct positions on the bases to be modified. The instant specification teaches all this to one skilled in the art. The Examiner does not contend otherwise.

The application also teaches one skilled in the art, by way of example, the synthetic chemistry needed to form the claimed modified compounds carrying the proper labels in the proper positions. Although the examples related specifically to the labelling of particular bases, exemplification of the labelling of

other bases is unnecessary under 35 U.S.C. § 112. The synthetic chemistry needed to make any modified pyrimidine, purine or 7-deazapurine, in accordance with the present invention, is analogous to that taught in the examples. Armed with applicants' teachings of which labels to use, where to put them, and how to label pyrimidines, one skilled in the art can use known synthetic methods to carry out analogous labelling in purines and 7-deazapurines without any undue experimentation. See, for example, Methods of Enzymology XXXIV, "Affinity Techniques; Enzyme Purification," Part B., ed. Jakoby and Wilchek (1974), pp. 485-86.

It is well-established that there is no need for exhaustive examples in the specification to satisfy the requirements of 35 U.S.C. §112. It is only necessary that there be no undue experimentation. Lindemann Maschinenfabrik v. Am. Hoist and Derrick, 730 F.2d 1452, 1463 (Fed. Cir. 1984). Even in an unpredictable art -- which the present invention is not -- 35 U.S.C. §112 does not require disclosure of a test with every species covered by a claim. In re Angstadt, 190 USPQ 214, 218:

> To require such a complete disclosure would apparently necessitate a patent application or applications with 'thousands' of catalysts along with information as to whether each exhibits catalytic behavior resulting in the production of hydroperoxides. More importantly, such a requirement would force an inventor seeking adequate patent protection to carry out a prohibitive number of actual experiments. This would tend to discourage inventors from filing patent applications in an unpredictable area since the patent claims would have to be limited to those embodiments which are expressly disclosed. A potential infringer could readily avoid 'literal' infringement of such claims by merely finding another analogous catalyst complex which could be used in 'forming hydroperoxides.'

Accordingly, applicants are not, and should not be, required to spell-out how to label every base encompassed by their claims. That teaching is available in the art and clearly supported by the

instant disclosure. Applicants, therefore, request withdrawal of this rejection.

Furthermore, applicants direct the Examiner to the allowed claims of U.S. Serial No. 07/130,070 and U.S. Serial No. 07/532,704 and the issued claims of U.S. Patent No. 4,711,955, which issued December 8, 1987. As indicated by the claims, both the allowed applications and the issued patent are directed to inventions that are related to the present invention. In the allowed applications and the issued patent, there are claims in which moiety 'B' is defined by the terms "purine", "deazapurine" and "pyrimidine". See, for example, independent claim 150 in U.S. Serial No. 07/130,070, independent claim 1 in U.S. Serial No. 07/532,704, and issued claims 1, 5, 9, 15 and 21 of U.S. Patent No. 4,711,955. Neither in the allowed applications nor in the issued patent were applicants required to restrict their invention to particular bases. Likewise, in the present application, applicants believe it to be unwise and improper to restrict their invention since it clearly is applicable to all the bases set forth in the claims as evidenced by the allowance and issuance of the above mentioned applications and patent.

Similarly, the description for moiety 'A' corresponds with the description for 'A' in allowed U.S. Serial No. 07/130,070 (see, independent claim 150), and is narrower than the allowed definition for the signalling moiety in U.S. Serial No. 07/532,704 (see, independent claim 1). Both of these applications evidence the definiteness of the description for 'A' and its fulfillment of the statutory requirements under 35 U.S.C. §112. Applicants also refer the Examiner to their earlier remarks regarding the definiteness of the description for 'A' with respect to the phrase "at least three carbon atoms".

Lastly, the Examiner criticized the terms "ligand", "enzyme", "detectable polypeptide" and "cofactor", all of which are used in the allowed claims of Serial No. 07/130,070 (see, e.g., claims 152, 153, 156, 157, 160, and 161). Again, the allowance of related claims having the same or similar terms as those being objected to here is clear evidence of the definiteness of these terms.

In light of the amendments to the claims and the arguments presented herein, applicants respectfully request that the Examiner reconsider and withdraw the rejections under 35 U.S.C. §112 and allow the application.

If a telephone conference would be of assistance in furthering the prosecution of the subject application, Applicant's undersigned attorney requests that he be contacted at the number provided.

No fee is deemed necessary in connection with the filing of this Amendment, other than the fee for a three-month extension of time. If any other fee is required, authorization is hereby given to charge the amount of any such fee to deposit account no. 12-1325.

Respectfully submitted,

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292 Madison Avenue
New York, New York 10017
(212) 532-4447

I hereby declare that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Commissioner of Patents and Trademarks, Washington, D.C. 20231

11/19/93
Date

John J. Santalone, Reg. No. 32,794

Exhibit A

United States Patent [19]

Ward et al.

[11] Patent Number: 4,711,955

[45] Date of Patent: Dec. 8, 1987

[54] MODIFIED NUCLEOTIDES AND METHODS OF PREPARING AND USING SAME

[75] Inventors: David C. Ward, Guilford, Conn.; Pennina R. Langer, Monsey, N.Y.; Alexander A. Waldrop, III, Charlottesville, Va.

[73] Assignee: Yale University, New Haven, Conn.

[21] Appl. No.: 496,915

[22] Filed: May 23, 1983

Related U.S. Application Data

[63] Continuation of Ser. No. 255,223, Apr. 17, 1981, abandoned.

[51] Int. Cl.⁴ C07H 17/02; C07H 19/06; C07H 19/02

[52] U.S. Cl. 536/29; 536/23; 536/24; 536/26; 536/27; 536/28

[58] Field of Search 536/27, 28, 29, 26, 536/24, 23; 435/5, 6

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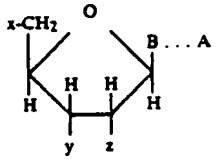
(List continued on next page.)

Primary Examiner—Nicky Chan

Attorney, Agent, or Firm—James F. Haley, Jr.

[57] ABSTRACT

Compounds having the structure:

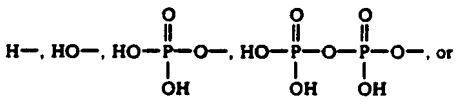


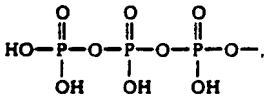
wherein B represents a purine, 7-deazapurine, or pyrimidine moiety covalently bonded to the C$^{1'}$-position of the sugar moiety, provided that when B is purine or 7-deazapurine, it is attached at the N^9-position of the purine or 7-deazapurine and when B is pyrimidine, it is attached at the N^1-position;

wherein A represents a moiety consisting of at least three carbon atoms which is capable of forming a detectable complex with a polypeptide when the compound is incorporated into a double-stranded ribonucleic acid, deoxyribonucleic acid duplex, or DNA-RNA hybrid;

wherein the dotted line represents a chemical linkage joining B and A, provided that if B is purine, the linkage is attached to the 8-position of the purine, if B is 7-deazapurine, the linkage is attached to the 7-position of the deazapurine, and if B is pyrimidine, the linkage is attached to the 5-position of the pyrimidine and

wherein each of x, y and z represents





either directly, or when incorporated into oligo- and polynucleotides, provide probes which are widely useful.

Applications include detection and localization of polynucleotide sequences in chromosomes, fixed cells, tissue sections, and cell extracts. Specific applications include chromosomal karyotyping, clinical diagnosis of nucleic acid-containing etiological agents, e.g. bacteria, viruses, or fungi, and diagnosis of genetic disorders.

21 Claims, No Drawings

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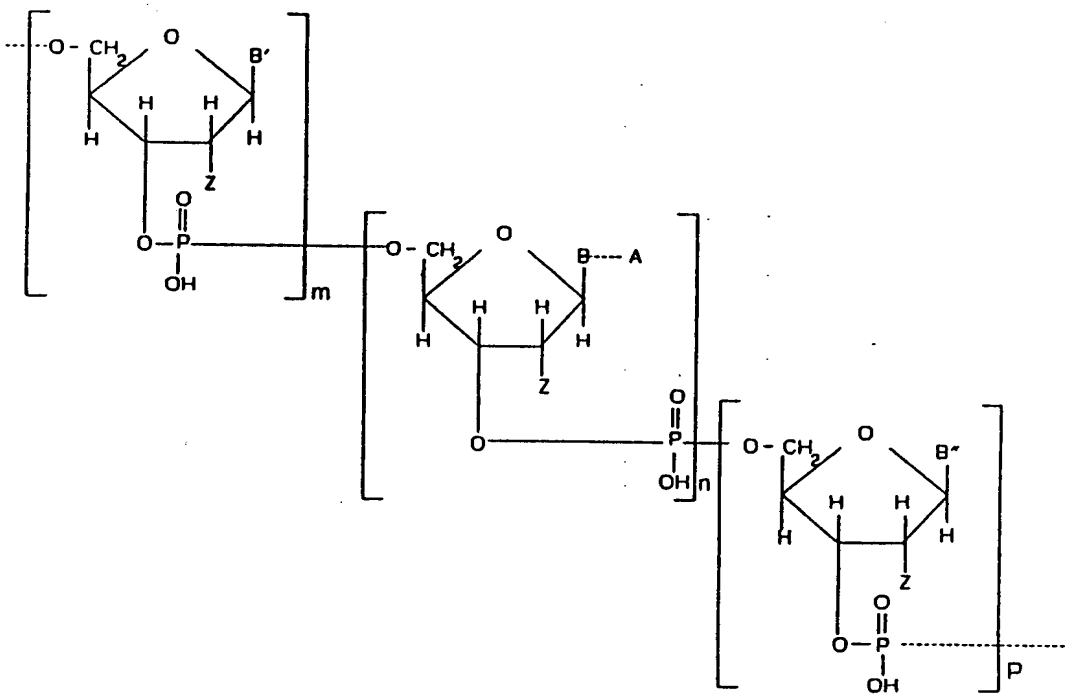
Exhibit B

150. A method of detecting the presence or absence of a nucleic acid in a sample which comprises the steps of:

(a) contacting under hybridizable conditions said sample with at least one compound comprising the structure:



wherein each of B' and B" represents a purine, 7-deazapurine, or pyrimidine moiety covalently bonded to the $C^{1'}$-position of the sugar moiety, provided that whenever B' or B" is purine or 7-deazapurine, the sugar moiety is attached at the N^9-position of the purine or 7-deazapurine, and whenever B' or B" is pyrimidine the sugar moiety is attached at the N^1-position of the pyrimidine;

wherein B represents 7-deazapurine or pyrimidine moiety covalently bonded to the $C^{1'}$-position of the sugar moiety, provided that whenever B is 7-deazapurine, the sugar moiety is attached at the N^9-position of the 7-deazapurine, and whenever B is pyrimidine the sugar moiety is attached at the N^1-position of the pyrimidine;

wherein A comprises at least three carbon atoms and represents at least one component of a signalling moiety capable of producing a detectable signal;

wherein B and A are covalently attached directly or indirectly through a linkage group, said linkage group not interfering substantially with the characteristic ability of said compound to hybridize with said nucleic acid or of A to be detected;

wherein if B is 7-deazapurine, A is attached to the 7-position thereof, and if B is pyrimidine, A is attached to the 5-position thereof;

wherein m, n and p are integers, provided that m and p are not simultaneously 0 and provided further n is never 0; and

wherein z represents H- or HO-; and

(b) detecting said compound or compounds so as to detect said nucleic acid.

126. The method of claim 150 wherein said nucleic acid is derived from a living organism.

127. The method of claim 126 wherein said living organism is selected from the group consisting of prokaryotes and eukaryotes.

128. The method of claim 150 wherein said sample is suspected of containing an etiological agent and said nucleic acid is associated with said etiological agent.

129. The method of claim 128 wherein said sample is of human or animal origin and said etiological agent is selected from the group consisting of bacteria, viruses and fungi.

130. The method of claim 150 wherein said sample comprises a microorganism suspected of containing a nucleic acid which imparts resistance to an antibiotic and wherein said compound comprises a polynucleotide complementary to the nucleic acid of said microorganism which confers resistance to said antibiotic.

134. The method of claim 150 wherein said sample is suspected of containing a nucleic acid associated with a genetic disorder and wherein said compound comprises a polynucleotide complementary to the nucleic acid associated with said genetic disorder.

135. The method of claim 150 wherein said sample is suspected of containing a nucleic acid associated with or absent in thalassemia and wherein said compound comprises a polynucleotide complementary to the nucleic acid which is associated with or absent in thalassemic subjects.

136. The method of claim 150 for chromosomal karyotyping which comprises contacting said sample with a series of said compounds which are complementary to a series of known genetic nucleic acids located on chromosomes.

142. The method of claim 150 wherein said sample is suspected of containing a nucleic acid which codes for expression of a polypeptide associated with a tumor cell and wherein said compound comprises a polynucleotide complementary to the messenger ribonucleic acid transcribed from a deoxyribonucleic acid associated with the production of said polypeptide.

143. The method of claim 142 wherein said polypeptide is α-fetal protein.

152. The method of claim 150 wherein the moiety A is a ligand.

153. The method of claim 152 wherein the ligand is selected from the group consisting of a hapten, an antigen, a cofactor, biotin and iminobiotin.

154. The method of claim 152 wherein the ligand is selected from the group consisting of dinitrophenol, lipoic acid and an olefinic compound.

156. The method of claim 152 wherein the ligand is capable of forming a complex by binding with a detectable polypeptide.

157. The method of claim 156 wherein the detectable polypeptide is selected from the group consisting of an antibody, an enzyme capable of depositing insoluble reaction products, streptavidin and avidin.

159. The method of claim 156 wherein the sample is contacted with the detectable polypeptide after hybridization of the compound or compounds to said nucleic acid under suitable conditions as to form the complex.

160. The method of claim 156 wherein an indicator molecule is associated with or bound to the detectable polypeptide.

161. The method of claim 160 wherein the indicator molecule is fluorescent, electron dense, or an enzyme capable of depositing insoluble reaction products.

162. The method of claim 161 wherein the enzyme is selected form the group consisting of alkaline phosphatase, peroxidase and β-galactosidase.

163. The method of claim 161 wherein the fluorescent indicator molecule is selected from the group consisting of fluorescein and rhodamine.

164. The method of claim 161 wherein the electron dense indicator molecule is selected from the group consisting of ferritin, hemocyanin and colloidal gold.

165. The method of claim 160 wherein the indicator molecule is covalently linked to the detectable polypeptide.

166. The method of claim 160 wherein the detectable polypeptide is indirectly detectable by specifically complexing the detectable polypeptide with a second polypeptide covalently linked to an indicator molecule.

167. The method of claim 166 wherein said detectable polypeptide is selected from the group consisting of avidin and streptavidin and the second polypeptide is selected from the group consisting of biotin and iminobiotin.

168. The method of claim 156 wherein at least one of said compounds is labeled with a first indicator molecule and at least one of said other compounds is labeled with a second indicator molecule.

169. The method of claim 168 wherein the compound labeled with the first indicator molecule is allowed to hybridize to the nucleic acid and is detected and then the compound labeled with the second indicator molecule is allowed to hybridize to the nucleic acid and is detected.

170. The method of claim 150 wherein the moiety A comprises an indicator molecule.

171. The method of claim 170 wherein said indicator molecule is fluorescent, electron dense, or is an enzyme capable of depositing insoluble reaction products.

172. The method of claim 171 wherein the enzyme is selected from the group consisting of alkaline phosphatase, peroxidase and β-galactosidase.

173. The method of claim 171 wherein the fluorescent indicator molecule is selected from the group consisting of fluorescein and rhodamine.

174. The method of claim 171 wherein the electron dense compound is selected from the group consisting of ferritin, hemocyanin and colloidal gold.

175. A method of claim 150 wherein said signalling moiety is capable of producing a detectable signal when the compound is incorporated into a double-stranded ribonucleic acid, deoxyribonucleic acid duplex or DNA-RNA hybrid.

176. The method of claim 150 wherein said detecting step (b) is carried out when the compound is hyridized to the nucleic acid.

177. The method of claim 150 wherein said nucleic acid is immobilized on a solid support.

178. The method of claim 150 wherein the moiety A comprises at least 5 carbon atoms.

179. The method of claim 150 wherein the moiety A is non-aromatic.

180. The method of claim 150 wherein B is selected from the group consisting of uracil, cytosine, deazaadenine, deazaguanine.

181. The method of claim 150 wherein the linkage group comprises an olefinic bond at the α-position relative to B.

182. The method of claim 181 wherein the linkage group comprises the moiety $-CH=CH-CH_2-NH-$.

183. The method of claim 181 wherein the linkage group comprises the moiety

$$-CH=CH-CH_2-O-CH_2-\underset{\displaystyle OH}{CH}-CH_2-NH-.$$

185. The method of claim 130 wherein when said microorganism is Streptococcus pyrogenes or Neisseria meningitidis, said antibiotic is penicillin, wherein when said microorganism is Staphylococcus aureus, Candida albicans, Pseudomonas aeruginosa, Streptococcus pyrogenes, or Neisseria gonorrhoeae, said antibiotic is a tetracycline, and wherein when said microorganism is Mycobacterium tuberculosis, said antibiotic is an aminoglycoside.

* * * * * * *

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SERIES CODE/SERIAL NO.	FILING DATE	TOTAL CLAIMS	EXAMINER AND GROUP ART UNIT	DATE MAILED
07/130,878	12/09/87	142	MARSCHEL, A.	09/ /93

First Named Applicant: WARD, DAVID C.

TITLE OF INVENTION: METHODS OF USING LABELED NUCLEOTIDES (AS AMENDED)

	ATTY'S DOCKET NO.	CLASS-SUBCLASS	BATCH NO.	APPLN. TYPE	SMALL ENTITY	FEE DUE	DATE DUE
1	YALE-1(CON'T)	435-006.000	522	UTILITY	NO	310.00	02/07/94

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THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT.

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Exhibit C

had found no evidence of professional misconduct.

Based on the foregoing, we hold that there was no sound basis for the trial court to disqualify the Chernoff firm, and accordingly *reverse* that portion of the judgment.

The parties shall bear their own costs.

AFFIRMED-IN-PART, REVERSED-IN-PART.

RALSTON PURINA COMPANY, Appellee,

v.

FAR-MAR-CO, INC., Appellant.

Appeal No. 84-1237.

United States Court of Appeals, Federal Circuit.

Sept. 19, 1985.

Patent infringement suit was filed involving patent describing process for directly and continuously restructuring oil seed particles, preferably soy particles, into textured, chewable, fibrous, meat-like food product. The United States District Court for the District of Kansas, Sam A. Crow, J., 586 F.Supp. 1176, determined that certain claims of patent were not invalid and determined that other claims were willfully infringed, and infringer appealed. The Court of Appeals, Baldwin, Circuit Judge, held that: (1) infringer, who contended disclosure in parent application was inadequate, bore burden before district court of showing by clear and convincing evidence that patent was invalid; (2) publication of parent application described certain claims of patent and, thus, rendered those claims invalid; (3) claims involving protein content of starting material and temperature and certain moisture content limitations for patent found support in parent application, and, thus, were entitled to effective filing of parent application; and (4) claims involving protein content and temperature and certain moisture limitations for patent were willfully infringed.

Affirmed in part and reversed in part.

Jack R. Miller, Senior Circuit Judge, filed opinion dissenting in part and concurring in part.

1. Patents ⇐112.1, 312(1⅛)

Under 35 U.S.C.A. § 282, a patent is presumed valid, and burden of persuasion to the contrary is and remains on party asserting invalidity.

2. Patents ⇐312(1⅛, 6)

Party asserting invalidity of a patent bears initial procedural burden of going forward to establish legally sufficient prima facie case of invalidity; if this burden is met, party relying on validity is then obligated to come forward with evidence to the contrary; before rendering its judgment, court must determine whether all of the evidence establishes that validity challenger so carries his burden as to have persuaded decisionmaker that patent can no longer be accepted as valid. 35 U.S.C.A. § 282.

3. Patents ⇐312(1⅛)

Party asserting invalidity of a patent based on 35 U.S.C.A. § 112, governing the content of the specification, bears no less burden and no fewer responsibilities than any other patent challenger. 35 U.S.C.A. § 282.

4. Patents ⇐312(4)

Burden of proof before district court for party asserting insufficient disclosure in parent application is to show by clear and convincing evidence that patent was invalid. 35 U.S.C.A. §§ 112, 282.

5. Patents ⇐106(1)

Objective of an interference, unlike that in a district court when invalidity of a patent is alleged, is to determine priority of invention.

6. Patents ⇐106(3)

After being accorded senior or junior party status, with concomitant procedural benefits (senior party) or burdens (junior

party), each party is responsible for establishing its case for sufficiency of disclosure in a prior application if it attempts to antedate a reference. 35 U.S.C.A. §§ 112, 119, 120.

7. Patents ⇐101(9)

Question of whether patent disclosure satisfies written description requirements of 35 U.S.C.A. § 112, governing the content of the specification, is based on questions of fact.

8. Patents ⇐114.25

Party asserting insufficient disclosure in parent application has burden of demonstrating that district court erred in its application of the law to the facts or that its findings of fact were clearly erroneous. 35 U.S.C.A. § 112.

9. Patents ⇐324.55(2)

Anticipation of a patent claim is a factual determination, reviewable under the clearly erroneous standard.

10. Patents ⇐72(1)

Anticipation of a patent claim requires that all limitations of claim are found in reference, or fully met by it.

11. Patents ⇐61

Publication of application for another patent disclosed importance of "minor amount of fat" present during extrusion and, thus, anticipated certain claims of subject patent, describing process for directly and continuously restructuring oil seed particles, particularly soy particles, into textured, chewable, fibrous, meat-like food product, and rendered those claims invalid for having been described in printed publication before invention by subject patent applicant, where publication specified same starting material claimed in subject patent, and trade defined "starting material" as having low levels of fat. 35 U.S.C.A. § 102(a).

12. Patents ⇐61

Publication of application for another patent described "plexilamellar" and, thus, anticipated claims of subject patent, describing process for directly and continuously restructuring oil seed particles, preferably soy particles, into textured, chewable, fibrous, meat-like food product, and rendered those claims invalid for having been described in printed publication before invention by subject patent applicant. 35 U.S.C.A. § 102(a).

13. Patents ⇐61

Publication of application for another patent disclosed desirability of separate zones of confinement or orifices in machinery used to mix and extrude product and, thus, anticipated claims of patent, describing process for directly and continuously restructuring oil seed particles, preferably soy particles, into textured, chewable, fibrous, meat-like food product, and rendered those claims invalid for having been described in printed publication before invention by subject patent applicant, where publication disclosed use of standard extruder, which, at the time, came equipped with structures specified in subject patent. 35 U.S.C.A. § 102(a).

14. Patents ⇐101(5), 114.25

Whether description requirement of 35 U.S.C.A. § 112 for a patent specification is met is a question of fact reviewable under the clearly erroneous standard.

15. Patents ⇐101(5)

Test for sufficiency of support in a parent application is whether disclosure of application relied upon reasonably conveys to artisan that inventor had possession at that time of later claimed subject matter.

16. Patents ⇐101(9)

Precisely how close original description of patent must come to comply with description requirement of specification statute, 35 U.S.C.A. § 112, must be determined on a case-by-case basis.

17. Patents ⇐101(9)

Disclosure of parent application adequately supported protein content of claims for subject patent for directly and continuously restructuring oil seed particles, preferably soy particles, into textured, chewable, fibrous, meat-like food product, so that such claims were entitled to effective filing date of parent application. 35 U.S.C.A. §§ 112, 120.

18. Patents ⇐101(9)

Parent application contained sufficient disclosure as to temperatures, so that temperature claims of patent describing process for directly and continuously restructuring oil seed particles, preferably soy particles, into textured, chewable, fibrous, meat-like food product, were entitled to effective filing date of parent application. 35 U.S.C.A. § 120.

19. Patents ⇐101(9)

Parent application contained sufficient disclosures as to moisture content limitations, so that certain moisture content limitation claims of patent describing process for directly and continuously restructuring oil seed particles, preferably soy particles, into textured, chewable, fibrous, meat-like food product, were entitled to effective filing date of parent application; however, other moisture content claims were entitled only to effective filing date of later application and, thus, were invalid for having been anticipated by publication of parent application. 35 U.S.C.A. § 120.

20. Patents ⇐324.55(5)

Finding of willful infringement of a patent is a question of fact and is not reversible upon appeal unless shown to be clearly erroneous.

21. Patents ⇐319(3)

Where potential infringer has actual notice of another's patent rights, he has affirmative duty to exercise due care to determine whether he is infringing, which duty usually includes, inter alia, duty to seek and obtain competent legal advice from counsel before initiation of any possible infringing activity.

22. Patents ⇐319(3)

Offering of a license is actual notice of another's patent rights.

23. Patents ⇐319(3)

Claims involving protein content of starting material, temperature limitations, and certain moisture content limitations for patent describing process for directly and continuously restructuring oil seed particles, preferably soy particles, into textured, chewable, fibrous, meat-like food product, were willfully infringed, where infringer had knowledge of its potential infringement liability and rejected license offer without even consulting its own in-house patent counsel.

Warren N. Williams, Schmidt, Johnson, Hovey & Williams, of Kansas City, Mo., argued for appellant. With him on brief was John M. Collins.

Randall G. Litton, Price, Heneveld, Huizenga & Cooper, of Grand Rapids, Mich., argued for appellee. With him on brief was Richard C. Cooper.

Before BALDWIN and BENNETT, Circuit Judges, and MILLER, Senior Circuit Judge.[1]

BALDWIN, Circuit Judge.

The decision of the United States District Court for the District of Kansas, holding claims 1–52 of U.S. Patent No. 3,940,495 (Flier) not invalid, and holding claims 1, 2, 8–20, 22, 23, 25, and 29–33 willfully infringed, is affirmed-in-part and reversed-in-part.

Facts

The Flier invention is the first successful process, and resultant product, for directly and continuously restructuring oil seed particles, preferably soy particles, into a textured, chewable, fibrous, meat-like food product. Restructuring is accomplished by mechanically working defatted, moistened soy particles under elevated temperature and pressure, into a flowable, plastic mass which is expanded into the restructured, fibrous, meat-like food product by suddenly releasing the pressure. The original application was filed July 10, 1964. A continued-in-part application was filed December 9, 1966. A continuation application was filed January 17, 1973, from which the patent issued. Although the 1964 application is more properly called a grandparent application, it will be referred to as the parent for the purposes of this opinion.

1. The Honorable Jack R. Miller assumed senior status effective June 6, 1985.

Interference 96,355, styled *Wilding v. Flier v. Atkinson*, was declared on May 23, 1968, involving the pending patent applications of Morris Wilding (assignor to Swift and Co.), Flier (assignor to Ralston Purina Co. (Ralston)) and William T. Atkinson (assignor to Archer-Daniels-Midland Co. (ADM)). Priority was eventually awarded to Flier on August 13, 1971. The interference was appealed, but settled by a cross-licensing arrangement on April 6, 1972. The settlement agreement provided that each party would grant to any third party making a written request a nonexclusive license under the claims of any existing or future patent.

On July 9, 1973, counsel for Flier specifically advised the examiner that an ADM patent application (the Dutch publication), No. 6506477, had been published on November 22, 1965, and that it corresponded generally to the Atkinson United States patent application which had been involved in the interference. The district court found specifically that this reference was brought to the examiner's attention after discovery in June, 1973, and that it was indeed a printed publication.

Claims which correspond to claims 8, 9, and 34–52 in Flier were allowed in an office action issued April 5, 1974. Additional claims were allowed in November 1, 1974. The remaining claims were allowed June 3, 1975.

Far-Mar-Co was licensed by ADM for the product described by the patent in suit. Upon issuance of Flier, Ralston offered a license to Far-Mar-Co, which was immediately declined. Ralston filed suit in district court for patent infringement approximately sixty days after Flier issued.

OPINION

The decisive issues in this case are:

1. Whether the trial court erred in deciding that Far-Mar-Co's burden of proof was to show by clear and convincing evidence that Flier was invalid.

2. Whether the trial court clearly erred in finding that the patent application of Archer Daniels Midland Company, No. 6506477 filed in the Patent Office of the Netherlands (Dutch publication) did not anticipate the claims of Flier.

3. Whether the trial court's finding that claims 10–13, 15–28, and 32 were descriptively supported by the parent application and thus entitled to the parent's 1964 filing date is clearly erroneous.

4. Whether the trial court's finding of willful infringement was clearly erroneous.

Burden of Proof

Far-Mar-Co contends that the district court erroneously imposed upon it the burden of proving insufficient disclosure in the parent application; also, that Ralston, as the party asserting adequate disclosure, should have borne the burden of demonstrating that adequate legal support exists. Ralston, on the other hand, argues that the district court correctly placed the burden of overcoming the presumption of validity by demonstrating insufficiency of disclosure on Far-Mar-Co, and found that Far-Mar-Co had not shown by clear and convincing evidence that it had met that burden.

[1–8] Far-Mar-Co incorrectly treats the burden of establishing a *prima facie* case of insufficiency of disclosure as if it bears no relationship to the burden of overcoming the presumption of validity accorded a patent under 35 U.S.C. § 282. A patent is presumed valid, and the burden of persuasion to the contrary is and remains on the party asserting invalidity. *W.L. Gore & Assoc., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1553, 220 USPQ 303, 313 (Fed.Cir.1983), *cert. denied*, — U.S. —, 105 S.Ct. 172, 83 L.Ed.2d 107 (1984). In addition, the party asserting invalidity also bears the initial procedural burden of going forward to establish a legally sufficient *prima facie* case of invalidity. If this burden is met, the party relying on validity is then obligated to come forward with evidence to the contrary. Before rendering its judgment, the court must determine whether "*all* of the evidence establishes that the validity challenger so carried his burden as to have persuaded the decisionmaker that the patent can no longer be accepted as valid."

Lear Siegler, Inc. v. Aeroquip Corp., 733 F.2d 881, 885, 221 USPQ 1025, 1028 (Fed. Cir.1984). A party asserting invalidity based on 35 U.S.C. § 112 bears no less a burden and no fewer responsibilities than any other patent challenger. Far-Mar-Co's burden of proof before the district court was to show by clear and convincing evidence that Flier was invalid. *See, e.g., Pennwalt Corp. v. Akzona, Inc.*, 740 F.2d 1573, 1578, 222 USPQ 833, 836 (Fed.Cir. 1984). The district court recognized and enunciated these rules. Accordingly, we hold that it did not place an impermissible burden upon Far-Mar-Co.[2] The question of whether disclosure satisfies the written description requirement of § 112 is based on questions of fact. *See In re Wilder*, 736 F.2d 1516, 1520, 222 USPQ 369, 372 (Fed. Cir.1984), *cert. denied*, — U.S. —, 105 S.Ct. 1173, 84 L.Ed.2d 323 (1985). Far-Mar-Co thus bears the burden of demonstrating that the court erred in its application of the law to the facts, *see Bose Corp. v. Consumers Union*, 466 U.S. 485, 104 S.Ct. 1949, 80 L.Ed.2d 502 (1984), or that its findings of fact were clearly erroneous.

Anticipation

[9, 10] Anticipation is a factual determination, revieawable under the "clearly erroneous" standard. *Lindemann Maschinenfabrik GMBH v. American Hoist & Derrick Co.*, 730 F.2d 1452, 1458, 221 USPQ 481, 485 (Fed.Cir.1984). A finding is "clearly erroneous" when although there is evidence to support it, the reviewing court on the entire evidence is left with the definite and firm conviction that a mistake has been committed. *United States v. U.S. Gypsum Co.*, 333 U.S. 364, 395, 68 S.Ct. 525, 542, 92 L.Ed. 746, 76 USPQ 430, 444 (1948); *SSIH Equipment S.A. v. USITC*, 718 F.2d 365, 381, 218 USPQ 678, 692 (Fed. Cir.1983). Anticipation requires that "all limitations of the claim are found in the reference, or 'fully met' by it." *Kalman v. Kimberly-Clark Corp.*, 713 F.2d 760, 772, 218 USPQ 781, 789 (Fed.Cir.1983).

Ralston contends, and the trial court found, that the Dutch publication was deficient because it failed to disclose (1) the importance of a "minor amount of fat" present during extrusion; (2) a definition for the word "plexilamellar" which was used to describe the product; and (3) the desirability of "separate zones of confinement or orifices" in the machinery used to mix and extrude the product. These findings are clearly erroneous.

[11] The first finding is clearly erroneous because the Dutch publication specifies the same starting material claimed in Flier, and the trade defines the starting material as having low levels of fat. The publication is therefore not deficient as to this element of Flier's claims.

[12] The second finding, that the Dutch publication does not define "plexilamellar" is unsupportable in view of the following passage from page 2 of that publication:

> The protein extrudate obtained according to the above mentioned method is a rough, resilient, dry to slightly moist to

2. Far-Mar-Co's reliance on *Wagoner v. Barger*, 463 F.2d 1377, 175 USPQ 85 (CCPA 1972), explains the vehemency with which it contends that the district court erred in assigning the burden of proof. *Wagoner* involved an interference in which the senior party owned the patent whose claims were copied to provoke the interference. With respect to the burden of proof on the issue of inherency, the court stated that "[c]learly, the burden of proving that language contained in the claims of the later application [which, in this case, were allowed to issue] is on the party asserting the equivalency ... and the burden is a heavy one." 463 F.2d at 1380, 175 USPQ at 86–87. The distinguishing feature between *Wagoner* and the present case is that *Wagoner* was an *interference*. Although the *test* for the adequacy of disclosure is the same, whether or not the proceedings are *ex parte* or *inter partes* before the Patent and Trademark Office, or before a district court, the burdens are allocated somewhat differently in each, due to their distinctive characteristics. The objective of an interference, unlike that in a district court when invalidity is alleged, is to determine priority of invention. After being accorded senior or junior party status, with the concomitant procedural benefits (senior party) or burdens (junior party), *each* party is responsible for establishing its case for sufficiency of disclosure in a prior application if it attempts to antedate a reference under §§ 112 and 120 or 119. Hence, the rule enunciated in *Wagoner*, 463 F.2d at 1380.

the touch, open celled foamy mass made up of interlaced interconnected strips of varying width and thickness which may appear fibrous or skin-like. The majority of the cells formed by this *plexilamellar* protein structure are.... [Emphasis added.]

[13] The third finding is similar to the first, and fails for a similar reason. The Dutch publication discloses the use of a standard extruder which, at the time, came equipped with the structure specified in the Flier patent. The publication is therefore not deficient as to this element of Flier's claims.

As a result of our disposition of this issue, only those claims entitled to the effective filing date, July 10, 1964, of the parent application remain in issue. The trial court held and Ralston does not contest, that claims 1–9, 14, 29–31, and 33–52 were entitled only to the effective filing date of the 1966 application. Thus, we hold these claims to be invalid for having been described in a printed publication before the invention thereof by the applicant for patent. 35 U.S.C. § 102(a).

Description Requirement

[14–16] The trial court held that claims 10–13, 15–28, and 32 of Flier are entitled to the effective filing date of the 1964 parent application because the parent application complies with the written description requirement of 35 U.S.C. § 112, first paragraph, which is incorporated in 35 U.S.C. § 120. Whether the description requirement is met is a question of fact reviewable under the clearly erroneous standard. *In re Wilder*, 736 F.2d 1516, 1520, 222 USPQ 369, 372 (Fed.Cir.1984), *cert. denied*, —— U.S. ——, 105 S.Ct. 1173, 84 L.Ed.2d 323 (1985). The trial court properly recognized that the test for sufficiency of support in a parent application is whether the disclosure of the application relied upon "reasonably conveys to the artisan that the inventor had possession at that time of the later claimed subject matter." *In re Kaslow*, 707 F.2d 1366, 1375, 217 USPQ 1089, 1096 (Fed.Cir.1983). Precisely how close the original description must come to comply with the description requirement of 35 U.S.C. § 112 must be determined on a case-by-case basis. *In re Wilder*, 736 F.2d 1516, 1520, 222 USPQ 369, 372 (Fed.Cir.1984).

Far-Mar-Co cites several range cases to support its argument that ranges found in the applicant's claim language must correspond exactly to ranges disclosed in the parent. These cases are not in point. The facts in these cases precluded a determination that one skilled in the art could derive the claim limitations from the parent, due to a number of different factors, e.g., the unpredictable nature of the art, *In re Sichert*, 566 F.2d 1154, 196 USPQ 209 (CCPA 1977); failure to distinguish one process from another, *In re MacLean*, 454 F.2d 756, 172 USPQ 494 (CCPA 1972); the addition of a critical limitation, *In re Blaser*, 556 F.2d 534, 194 USPQ 122 (CCPA 1977); failure to define a critical term, *In re Lukach*, 442 F.2d 967, 169 USPQ 795 (CCPA 1971); and use of a list that did not contain the claimed substance. *In re Ahlbrecht*, 435 F.2d 908, 168 USPQ 293 (CCPA 1971). In addition, a predecessor to this court has held "that a claim may be broader than the specific embodiment disclosed in a specification is in itself of no moment." *In re Rasmussen*, 650 F.2d 1212, 1215, 211 USPQ 323, 326 (CCPA 1981). Far-Mar-Co argues that the claims remaining in issue contain new matter at least with respect to the protein content of the starting material, total and added moisture, temperature ranges, and the situs of fiber formation. Far-Mar-Co contends that although the 1964 parent application would enable one skilled in the art to practice the invention claimed, it does not meet the description requirement under 35 U.S.C. § 112.

With respect to protein content, Far-Mar-Co argues that the claim language "protein content of at least about that of solvent extracted soybean meal" is not supported by the language of the parent application, which speaks of "soybean meal having a low fat and high protein content." The parent application also states that "[s]uch 50% protein soybean meal is well known and frequently is a by-product of the process of oil extraction from soybeans. Such meal is preferably solvent extracted to de-

crease the fat content thereof to the range mentioned above." Further, "[s]oybean meal having a protein content of approximately 50% is the preferred meal component for use in the present invention. When, however, the meal has a protein content of substantially less than 50%, it may be mixed with a high protein component which will increase the protein content of the combination to the preferred 50%."

[17] The trial court found that the parent disclosure does support the claim language, based on the 1964 disclosure and on consideration of the knowledge possessed by those skilled in the art of extrusion of both farinaceous and proteinaceous vegetable materials in 1964. The trial court found that soybean meal of 44%, 50%, 70%, and 90% protein were standard, available commodities in 1964. The trial court also found that the parent, which disclosed a "high protein content" and a preferred lower level but no upper limit, and indicated that protein content could be adjusted, reasonably conveyed adjustment of the protein content of soybean meal to levels above 50%. Having considered Far-Mar-Co's arguments, we conclude that the court did not clearly err in determining that the parent's disclosure adequately supports the protein content of the claims in issue.

[18] With respect to temperature, Far-Mar-Co argues that the claim limitation "in excess of 212° F" and "substantially above 212° F" are not supported by the parent application. The trial court found that experts from both parties were in substantial agreement that the parent application sets the critical lower limit for temperature at 212° F and supports this limit in the patent claims. The trial court considered evidence of what the skilled artisan would appreciate about the sources of heat in the process, both steam heat and the pressure brought to bear on the mixture, as well as the limitations of the equipment disclosed. The trial court also noted that Far-Mar-Co's expert agreed that the claim language calling for the temperature "being increased substantially" found support in the parent application. On the basis of this record, it was not clear error for the court to find sufficient disclosure in the parent application for the above-mentioned limitations.

[19] Far-Mar-Co argues that the trial court clearly erred in finding support in the parent for the moisture content limitations. The trial court considered (1) evidence that the purpose of moisture in the mix was to make the material flow through the extruder; (2) the physical characteristics of mixtures with varying levels of water; (3) the type of test and degree of accuracy in testing for moisture level; and (4) the approximate amount of moisture known by those skilled in the art to be contained in soybean meal. Based on this evidence and the formulations disclosed in the parent application, the court allowed both parties to calculate approximate upper and lower moisture limits supportable by the parent application. It found inadequate descriptive support in the parent application for the moisture limitations of "at least about 20%" and of those claims calling for a total moisture content "between about 20% and 40% by weight," and the parties do not contest these findings. The court found adequate support for moisture levels of "at least about 25% by weight," "at least 25% by weight," and "in the range of 20–30% of the resulting mixture." The trial court noted that claims simply calling for sufficient water to permit the resulting mixture to be passed through an extruder or calling for approximately 25% of the mixture were not challenged. The trial court's rationale for striking down the claims with endpoints of 20% and 40% was that these limits could not be justified solely by the so-called ball test for moisture content. Those claims would convey new information to one skilled in the art. The open-ended claims, however, would be limited by what a person skilled in the art would understand to be workable. After careful consideration of Far-Mar-Co's arguments, we conclude that the court did not clearly err in determining that the parent's disclosure adequately supported the water ranges of "at least about 25% by weight," and "at least 25% by weight." The court, however, did clearly err in finding support in the parent for the limitation: "in the range of

20%–30% of the resulting mixture" contained in claims 19, 27, and 28. We hold these claims are entitled only to the effective filing date of the 1966 application and are therefore invalid for having been anticipated by the Dutch publication.

Far-Mar-Co's argument that the parent application requires fiber formation inside the extruder is adequately disposed of by the trial court's opinion.

In sum we conclude that claims 10–13, 15–18, 20–26, and 32 of the Flier patent are entitled to the effective filing date of the 1964 parent application because the parent application adequately supports those claims for purposes of 35 U.S.C. § 120.

Willful Infringement

[20] A finding of willful infringement is a question of fact and is not reversible upon appeal unless shown to be clearly erroneous. *Underwater Devices, Inc. v. Morrison-Knudsen Co.*, 717 F.2d 1380, 1389, 219 USPQ 569, 576 (Fed.Cir.1983). Far-Mar-Co has failed to persuade us that the district court's finding is clearly erroneous.

[21, 22] The trial court found willful infringement based on Far-Mar-Co's "conduct after issuance of the patent, particularly the decision to respond to plaintiff's offer of a license without consulting patent counsel." When a potential infringer has actual notice of another's patent rights, he has an affirmative duty to exercise due care to determine whether or not he is infringing. *Underwater Devices, Inc. v. Morrison-Knudsen Co.*, 717 F.2d at 1389–90, 219 USPQ at 576. Such an affirmative duty usually includes, inter alia, the duty to seek and obtain competent legal advice from counsel before the initiation of any possible infringing activity. *Id. See also, King Instrument Corp. v. Otari Corp.*, 767 F.2d 853, 867, 226 USPQ 402, 412 (1985). The offering of a license is actual notice. *Leinoff v. Louis Milona & Sons, Inc.*, 726 F.2d 734, 743, 220 USPQ 845, 851 (Fed.Cir.1984).

[23] Far-Mar-Co's argument that it did not infringe willfully because Ralston withdrew its offer too quickly is unpersuasive. There is evidence of record that Far-Mar-Co has known of its potential infringement liability to Ralston since 1970. At that time, Ralston was involved in an interference proceeding with other parties, one of whom was Far-Mar-Co's licensor. Far-Mar-Co received notice that Ralston won the interference in April, 1972. After the Ralston patent issued in 1976, Far-Mar-Co rejected a license offer without even consulting its own in-house patent counsel. Far-Mar-Co cites no precedent for a decision that an infringer must be allowed a certain amount of time to "develop" willfulness, and we will not supply it. On the basis of this record, we cannot say the court clearly erred in its finding.

Accordingly, we agree with the district court's decision that claims 10–13, 15–18, 20–26, and 32 of the Flier patent have not been shown to be invalid. We *affirm* the holding of infringement of claims 10–13, 15–18, 20, 22, 23, and 32. We hold claims 1–9, 14, 19, 27–31, and 33–52 to be invalid. Finally, we *affirm* the finding of willful infringement.

AFFIRMED-IN-PART AND REVERSED-IN-PART.

JACK R. MILLER, Senior Circuit Judge, dissenting in part and concurring in part.

I cannot agree with the section in the majority opinion concerning the "written description" requirements of 35 U.S.C. § 112, first paragraph with respect to claims 10–13, 15–28, and 32.

It is necessary that Flier be entitled to its grandparent application's filing date under 35 U.S.C. § 120 if it is to avoid the invalidating effect of the ADM anticipating reference under 35 U.S.C. § 102(a). To be entitled to the benefit of the date of a previously filed copending application under section 120, such application must contain a written description of the invention claimed, and of the manner and process of making and using it, as set forth in the later application to comply with the first paragraph of section 112.

The invention claimed in the later application does not have to be described in the

prior application *in ipsis verbis* in order to satisfy the description requirement of section 112. *Martin v. Johnson*, 454 F.2d 746, 751, 172 USPQ 391, 395 (CCPA 1972); *see Case v. CPC International, Inc.*, 730 F.2d 745, 751, 221 USPQ 196, 201 (Fed.Cir.), *cert. denied*, — U.S. —, 105 S.Ct. 223, 83 L.Ed.2d 152, 224 USPQ 736 (1984). However, claims with no explicit disclosure must find inherent support in the prior application, *Pingree v. Hull*, 518 F.2d 624, 186 USPQ 248 (CCPA 1975); and one skilled in the art, *following the teaching* of the prior application must be able to produce the subject matter of the later claims. *In re Magerlein*, 346 F.2d 609, 612, 145 USPQ 683, 685 (CCPA 1965); *In re Nathan*, 328 F.2d 1005, 1008–09, 140 USPQ 601, 604 (CCPA 1964). Thus, the test for determining whether the disclosure complies with the written description of the invention requirement is whether it would have reasonably conveyed to one of ordinary skill that the inventor invented the later-claimed subject matter. *In re Kaslow*, 707 F.2d 1366, 1375, 217 USPQ 1089, 1096 (Fed.Cir.1983). The "legal" equivalent of the claim language is thus the "*necessary and only reasonable* construction" to be given the disclosure in the parent application by one skilled in the art. *In re Filstrup*, 251 F.2d 850, 853, 116 USPQ 440, 442 (CCPA 1958). The result claimed must "inevitably occur." *See Kooi v. DeWitt*, 546 F.2d 403, 409, 192 USPQ 268, 273 (CCPA 1976); *Pingree*, 518 F.2d at 627, 186 USPQ at 251.

Section 112 does not refer to a mere "support" standard. In *In re Smith*, 458 F.2d 1389, 1394, 173 USPQ 679, 683 (CCPA 1972), the court stated that "[t]he recent cases suggests [*sic*] a more stringent requirement for a description of the claimed invention than may have been previously applied in cases wherein the issue was framed in terms of 'support' for claimed subject matter." The original disclosure may not be relied upon unless it "constitute[s] a full, clear, concise and exact description ... of the invention claimed" in the patent to one of ordinary skill. *In re Wertheim*, 646 F.2d 527, 538–39, 209 USPQ 554, 565 (CCPA 1981) ("*Wertheim II*").

The test of adequacy of disclosure is neither anticipation (*e.g., In re Scheiber*, 587 F.2d 59, 199 USPQ 782 (CCPA 1978)) nor obviousness (*see, e.g., In re Piasecki*, 745 F.2d 1468, 1473, 223 USPQ 785, 789 (Fed.Cir.1984)). Thus, it is not proper under section 112 to require that a person of ordinary skill determine by "extrapolation, interpolation and assumptions" (*Ex parte Eggleston*, 159 USPQ 692, 693 (PTO Bd. App.1967)) that disclosure in the prior application would achieve a product possessing characteristics of, or operating within the ranges of numerical values set forth in, the later claimed subject matter. *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976) ("*Wertheim I*"), *later appealed*, 646 F.2d 527, 209 USPQ 554 (CCPA 1981).

To carry its burden of demonstrating insufficient disclosure, Far-Mar-Co must show that the grandparent application would not have taught persons skilled in the art that the ranges of each item claimed in the patent claims were Flier's invention.[1]

With respect to protein content of the soybean meal, Far-Mar-Co asserts that the requirements in the Flier patent claims for "vegetable material having a protein content of at least about that of solvent-extracted soybean meal" (claims 15–17 and 32) and for "solvent-extracted soybean material having a protein content at least about that of solvent-extracted soybean meal" (claims 18–26) are not inherent in the grandparent specification, since each claim limitation is an open-ended range of up to 100% protein.

The grandparent contains the following references to soybean meal protein:

> It has been found that soybean meal having a low fat and *high protein content* may be treated to form the desirable products of the present invention. Preferably the soybean meal has a fat content as low as 0.5% and a *protein con-*

1. The sufficiency of Far-Mar-Co's *prima facie* case is not at issue, since the district court evidently considered all of the evidence produced by both parties.

tent of approximately 50%. Such *50% protein soybean meal* is well known and frequently is a by-product of the process of oil extraction from soybeans....

....

Example 1 As a specific example, 17 pounds of 50% *soybean meal having a protein content of 50%*, a fat content of....

Example 2

....

Soybean meal having a protein content of approximately 50% is the preferred meal component for use in practicing the present invention. *When, however, the meal has a protein content of substantially less than 50%*, it may be mixed with a high protein component which will *increase the protein content of the combination to the preferred 50%.*

(Emphasis supplied.) The district court noted that most of the references to protein concentrations in the grandparent application emphasize the importance of "approximately" 50% protein soybean meal. It also found that in Example 2 the grandparent indicates that soybean meal lacking sufficient protein concentration may be altered to produce the preferred percentage.

The court also referred to the Soybean Blue Book for 1964 and the Yearbook and Trading Rules for 1964–1965, in which it found reflected the knowledge in the art that the protein content of 50% solvent-extracted soybean meal was "minimum 50%" and that 44% soybean meal was also available. The court also noted that soybean protein concentrate and soybean protein isolate (not soybean meal as the majority opinion suggests), with protein concentrations over 50%, were "well known" in the art in 1964.

I am persuaded that the district court erred when it found from these references (in combination with the grandparent specification disclosure of "about 50%" and "approximately 50%" protein) that "[i]t is doubtful that a person skilled in the art would ... have construed from the parents [*sic*] disclosure a maximum protein limit of about 50%." (Finding 139.) By assuming that those of ordinary skill in 1964 would have had additional reference materials for use in creating limitations in the grandparent specification, the court erroneously applied an obviousness analysis, transgressing this court's declaration in *Piasecki*, 745 F.2d at 1473, 223 USPQ at 789, and *In re Shetty*, 566 F.2d 81, 86, 195 USPQ 753, 756 (CCPA 1977), *reh'g denied* (Jan. 19, 1978), that the specification itself must be the source of its interpretation (with respect to scope) for one of ordinary skill. *In re Ruschig*, 379 F.2d 990, 995–96, 154 USPQ 118, 123 (CCPA 1967).

The district court also found that "[a]djustment of the protein content of soybean meal to a level above 50% is reasonably conveyed where the disclosure set forth a requirement of a 'high protein content,' disclosed the preferred level but no upper limit...." By taking this language out of context, the court erred in its interpretation of the specification. The language should have been read *in pari materia* with the sentence that follows it, which clearly indicates that Flier equated "high protein content" with "approximately 50%." I disagree with the gloss imposed on the language of the grandparent application by the majority opinion. The *patent* claim language is not the only *"necessary and reasonable"* construction of the language in the grandparent application (*In re Filstrup*, 251 F.2d at 853, 116 USPQ at 442), and a "level above 50%" is not the "inevitable" interpretation of "about," "approximately," or even "preferably" 50%. *Cf. Kropa v. Robie*, 187 F.2d 150, 154–55, 88 USPQ 478, 483 (CCPA 1951).

The district court conceded that the "open-ended range of from about 50% to 100%" is "in part predicated on the assumption that solvent-extracted soybean meal contains about 50% protein." If this means, as the majority asserts, that the district court found that the grandparent application discloses a "preferred lower limit," such finding is clearly erroneous. The grandparent application does state that 50% protein meal was the preferred concentration. However, in view of the language in the grandparent application expressing

Flier's knowledge that "substantially less than 50%" protein was a class of protein concentrations known to him at that time (which concentrations were readily raised to the preferred 50%), I cannot agree that the grandparent taught 50% protein concentration as a "preferred lower limit." Rather, if "preferred" is to be interpreted as a limitation, the more reasonable construction in this case would be as an upper limit. I conclude that the district court erred in finding that the Flier patent claims containing limitations on protein content of soybean meal were sufficiently disclosed in the 1964 grandparent application.

With respect to moisture content, Far-Mar-Co contends that the district court erred in concluding that the Flier claims limitations were sufficiently disclosed in the grandparent application. The 1964 grandparent recites, in the examples, 17 pounds of soybean meal "mixed with 2600 cc. of water" or 2850 cc. (It is undisputed that 2600 and 2850 cc. are 25 and 27% by weight, respectively, of the mixtures recited in the examples.) The claims limitations refer to "at least about 25% by weight" (claims 10–13) and "at least 25% by weight" (claims 15–17, 32).

These findings by the district court suffer from the same infirmities as do those with respect to protein concentration. Although written disclosure cases must be determined on a case-by-case basis (*e.g., In re Driscoll*, 562 F.2d 1245, 1250, 195 USPQ 434, 438 (CCPA 1977)) *Wertheim I, supra*, opposes extending, without limitation, the range of the only examples stated in the prior application in a situation similar to the present claims 10–13, 15–17, and 32. *See In re Ahlbrecht*, 435 F.2d 908, 168 USPQ 293 (CCPA 1971); *Smith*, 458 F.2d at 1394–95, 173 USPQ at 683 (disclosure of genus and one species not sufficient description of intermediate subgenus). Certainly, genera and subgenera ranges which substantially deviate from the two species disclosed in the grandparent are not sufficiently described when there is no suggestion to those skilled in the art that such ranges of moisture are embraced by the original invention.

In reaching its conclusions, the district court relied on (1) "the practice" at Ralston in 1964, (2) "squeeze test," and (3) knowledge of those skilled in the art of the moisture content of soybean meal. It should be pointed out that "the practice" at Ralston in 1964 does not even appear to be within the knowledge of one of ordinary skill, and neither a "squeeze test" nor the importance of the moisture content of soybean meal is suggested in the grandparent application. *Cf. In re Salmon*, 705 F.2d 1579, 1581, 217 USPQ 981, 983 (Fed.Cir. 1983); *Wertheim I*, 541 F.2d at 267–68, 191 USPQ at 101. I am persuaded that the district court's findings on moisture content limitations are clearly erroneous.

Far-Mar-Co also contests the findings of the district court on the issue of the range of processing temperatures. The 1964 application recites a range of 212–360°F in one example and states elsewhere that the mixture "must be subjected to heat ... during the extrusion process." The Flier patent claims recite "in excess of 212°F" (claim 10) and "substantially above 212°F" (claims 11–13, 15–16, 28, and 32). These findings of the court are subject to the same criticism as are those relating to moisture content. The reasoning in *Wertheim I, Ahlbrecht*, and *Smith* applies to the limitations in claims 10, 15–16, 28, and 32. "[I]nto the range of 212–310°F" (claim 27) requires further discussion, because this range is totally within the range explicitly disclosed in the grandparent.

The court in *Wertheim II* held that the disclosure in the parent of 25% to 60% solids content, without more, did not satisfy the description requirement of the later claimed 35% to 60% solids concentration, because the claimed range was a significant restriction on the invention. 646 F.2d at 538, 209 USPQ at 565. Analogous is claim 27, in which Ralston attempts to rely upon the grandparent's disclosure of 212–380°F. Although it is likely, as the district court states, that "the skilled artisan would observe a practical upper limit of avoiding burning or scorching material passing through the extruder" (Finding 151), the ADM reference indicates that extrusion temperatures of 450°F were feasible in

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1965. Without any suggestion in the grandparent that temperatures above 310°F would damage the product, there is no "inevitable" or "necessary and only reasonable construction" of the grandparent's disclosure as having the upper limit of 310°F in claim 27. *Cf. In re Salmon*, 705 F.2d at 1581, 217 USPQ at 983.

Finally, on the issue of situs of fiber formation (claims 10–13, 15–28, and 32), I concur with the majority opinion that Far-Mar-Co has not demonstrated that the district court clearly erred. Although Flier did not know in 1964 where fiber formation occurred, I am persuaded that one of ordinary skill in the art would have been taught by the grandparent disclosure how the invention was practiced. *See Spero v. Ringold*, 377 F.2d 652, 656, 153 USPQ 726, 728–29 (CCPA 1967); *In re Magerlein*, 346 F.2d at 611–12, 145 USPQ at 685. The invention "may well [have been] disclosed without positive identification." *Petisi v. Rennhard*, 363 F.2d 903, 907, 150 USPQ 669, 672 (CCPA 1966); *see Foss v. Oglesby*, 127 F.2d 312, 317, 53 USPQ 356, 361 (CCPA 1942).

In view of the foregoing, Ralston cannot rely on Flier's 1964 grandparent application for priority under sections 112 and 120 for claims 10–13, 15–28, and 32. Thus, these claims are rendered invalid by the ADM anticipating reference.

I do not join the majority on the issue of willfulness because it is rendered moot in light of my dissent.

Exhibit D

UNITED STATES DEPARTMENT OF COMMERCE
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Washington, D.C. 20231

SERIAL NUMBER	FILING DATE	FIRST NAMED APPLICANT	ATTORNEY DOCKET NO.
07/532,704	06/04/90	ENGELHA	D ENZ-501V.4

EXAMINER: ROLLINS, J

ART UNIT: 1803 | PAPER NUMBER:

DATE MAILED: 09/16/92

SERLE I. MUSOFF
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NOTICE OF ALLOWABILITY

PART I.

1. [X] This communication is responsive to Response of 7-30-92 + 9-2-92
2. [X] All the claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice Of Allowance And Issue Fee Due or other appropriate communication will be sent in due course.
3. [X] The allowed claims are 1 + 204 - 237
4. [X] The drawings filed on 6/04/90 are acceptable.
5. [ ] Acknowledgment is made of the claim for priority under 35 U.S.C. 119. The certified copy has [_] been received. [_] not been received. [_] been filed in parent application Serial No. _____, filed on _____.
6. [ ] Note the attached Examiner's Amendment.
7. [X] Note the attached Examiner Interview Summary Record, PTOL-413.
8. [ ] Note the attached Examiner's Statement of Reasons for Allowance.
9. [ ] Note the attached NOTICE OF REFERENCES CITED, PTO-892.
10. [ ] Note the attached INFORMATION DISCLOSURE CITATION, PTO-1449.

PART II.

A SHORTENED STATUTORY PERIOD FOR RESPONSE to comply with the requirements noted below is set to EXPIRE THREE MONTHS FROM THE "DATE MAILED" indicated on this form. Failure to timely comply will result in the ABANDONMENT of this application. Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

1. [ ] Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL APPLICATION, PTO-152, which discloses that the oath or declaration is deficient. A SUBSTITUTE OATH OR DECLARATION IS REQUIRED.
2. [ ] APPLICANT MUST MAKE THE DRAWING CHANGES INDICATED BELOW IN THE MANNER SET FORTH ON THE REVERSE SIDE OF THIS PAPER.
   a. [ ] Drawing informalities are indicated on the NOTICE RE PATENT DRAWINGS, PTO-948, attached hereto or to Paper No. _____. CORRECTION IS REQUIRED.
   b. [ ] The proposed drawing correction filed on _____ has been approved by the examiner. CORRECTION IS REQUIRED.
   c. [ ] Approved drawing corrections are described by the examiner in the attached EXAMINER'S AMENDMENT. CORRECTION IS REQUIRED.
   d. [ ] Formal drawings are now REQUIRED.

Any response to this letter should include in the upper right hand corner, the following information from the NOTICE OF ALLOWANCE AND ISSUE FEE DUE: ISSUE BATCH NUMBER, DATE OF THE NOTICE OF ALLOWANCE, AND SERIAL NUMBER.

Attachments:

- _ Examiner's Amendment
- X Examiner Interview Summary Record, PTOL-413
- _ Reasons for Allowance
- _ Notice of References Cited, PTO-892
- _ Information Disclosure Citation, PTO-1449
- _ Notice of Informal Application, PTO-152
- _ Notice re Patent Drawings, PTO-948
- _ Listing of Bonded Draftsmen
- _ Other

JOHN W. ROLLINS
PRIMARY EXAMINER
ART UNIT 183

PTOL-37 (REV. 4-89) *

USCOMM-DC 89-3789

ENZ-5 (DIVISION 4) - ALLOWED CLAIMS 1 & 204-233

1. A nucleotide having the formula PM-SM-BASE-Sig wherein PM is a phosphate moiety, SM is a sugar moiety, BASE is a pyrimidine, purine or 7-deazapurine moiety, PM being attached at the 3' or the 5' position of SM when the nucleotide is a deoxyribonucleotide and at the 2', 3' or 5' position when the nucleotide is a ribonucleotide, BASE being attached to the 1' position of SM from the N^1 position when BASE is a pyrimidine or the N^9 position when BASE is a purine or a 7-deazapurine, and Sig is covalently attached to BASE at a position other than the C^5 position when BASE is a pyrimidine, at a position other than the C^8 position when BASE is a purine and at a position other than the C^7 position when BASE is a 7-deazapurine and wherein Sig represents a detectable moiety.

204. An oligo- or polydeoxyribonucleotide comprising at least one nucleotide in accordance with Claim 1.

205. An oligo- or polyribonucleotide comprising at least one nucleotide in accordance with Claim 1.

206. A nucleotide in accordance with Claim 1 wherein Sig is a moiety containing at least 3 carbon atoms.

207. The nucleotide of Claim 1 wherein Sig is selected from the group consisting of mono-, oligo- and polysaccharides.

208. The nucleotide of Claim 207 wherein Sig is selected from the group consisting of triose, tetrose, pentose, hexose, heptose and octose.

209. The nucleotide of Claim 1 wherein Sig includes a glycosidic linkage moiety.

210. The nucleotide of Claim 1 wherein Sig is a sugar residue and such sugar residue is complexed with a binding protein for such sugar residue.

211. The nucleotide of Claim 210 wherein such binding protein is a lectin.

212. The nucleotide of Claim 211 wherein such lectin is Concanavalin A.

213. The nucleotide of Claim 1 wherein Sig comprises a component selected from the group consisting of biotin, iminobiotin, an electron dense component, a magnetic component, an enzyme, a hormone component, a radioactive component, a metal-containing component, a fluorescent component, an antigen, a hapten and an antibody component. a chemiluminescent component

214. The nucleotide of Claim 213 wherein such electron dense component is ferritin.

215. The nucleotide of Claim 211 wherein such lectin is conjugated to ferritin.

216. The nucleotide of Claim 212 wherein said Concanavalin A is conjugated to ferritin.

217. The nucleotide of Claim 213 wherein Sig comprises a radioactive isotope.

218. The nucleotide of Claim 217 wherein such radioactive isotope is radioactive cobalt.

219. The nucleotide of Claim 213 wherein Sig comprises an enzyme.

220. The nucleotide of Claim 219 wherein such enzyme is selected from the group consisting of alkaline phosphatase, acid phosphatase, B-galactosidase, ribonuclease, glucose oxidase and peroxidase.

221. The nucleotide of Claim 213 wherein Sig comprises a fluorescent component.

222. The nucleotide of Claim 221 wherein such fluorescent component is selected from the group consisting of fluorescein, rhodamine and dansyl.

223. The nucleotide of Claim 213 wherein Sig comprises a magnetic component.

224. The nucleotide of Claim 223 wherein such magnetic component comprises a magnetic oxide.

225. The nucleotide of Claim 224 wherein such magnetic oxide is ferric oxide.

226. The nucleotide of Claim 213 wherein Sig includes a hapten component capable of complexing with an antibody specific thereto.

227. The nucleotide of Claim 1 wherein Sig includes a catalytic metal-containing component.

228. An oligo- or polynucleotide comprising at least one nucleotide of Claim 1 and wherein the oligo- or polynucleotide is terminally ligated or attached to a polypeptide.

229. A composition comprising an oligo-or polynucleotide including at least one nucleotide of Claim 1, a polypeptide capable of forming a complex with Sig and a moiety which can be detected when such complex is formed.

230. The composition of Claim 229 wherein such polypeptide comprises a polylysine.

231. The composition of Claim 229 wherein such polypeptide is selected from the group consisting of at least one of avidin, streptavidin and anti-Sig immunoglobulin.

232. The composition of Claim 229 wherein Sig is a ligand and such polypeptide is an antibody thereto.

233. The composition of Claim 229 wherein said detectable moiety is selected from the group consisting of biotin, iminobiotin, an electron dense component, a magnetic component, an enzyme, a hormone component, a radioactive component, a metal-containing component, a fluorescent component, an antigen, a hapten and an antibody component.

a chemiluminescent component